

# California State University | Stanislaus

## BIOL 4840- Genetic Biotechnology

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Instructor:	Dr. James J. Youngblom	Term:	Spring 2016
Office:	Naraghi Hall 264	Lecture Times	Mon., Fri. 11:00-11:50
Office Phone:	667-3950	Lab Times:	Wed. 11:00-12:50
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Office Hours:	12-1 Mon, 1-2 Wed, Tu 11:30-12:30 (in N124), or by appt.		

### University Course Catalog Description

BIOL 4840 3.0 units. Principles and applications of recombinant DNA technology. Emphasis on the tools of gene manipulation, genomic scale analysis, and bioinformatics. Weekly activity involving DNA analysis software. **Prerequisite: BIOL 3350.** (Lecture, 2 hours; activity, 2 hours)

### Course Requirements

Students need knowledge of DNA structure, eukaryotic gene organization, transcription and translation, Mendelian genetic terminology, molecular properties, and chemical bonds. Basic level computer skills are required (web browsing, word, excel).

### Course Learning Outcomes

By the end of this course students will understand how to clone a gene and the value of genomic and cDNA libraries. Students will be able to explain PCR, RNAi, DNA sequencing methods, gel electrophoresis, Southern and Northern blotting. Students will know how to select the appropriate molecular tools given a particular biological question. Students will appreciate the various approaches to gene mapping. Students will understand why various methods are used for expression of gene products. Student will be able to select and utilize the appropriate DNA sequence analysis software. Students will know how to efficiently read an article from primary literature. Students will know how to assemble and appropriately prepare and present a PowerPoint presentation.

### **Required Texts-**

- 1) Biotechnology, second edition by David Clark, Nanette Pazdernik 2016
- 2) Neanderthal Man: In Search of Lost Genomes by Svante Pääbo (paperback available soon)

### Dates to Remember-

Wed. Feb. 24- Last day to drop a course  
Mon. Mar. 21- Lecture online only (YouTube)  
Spring Break- No classes, Mar. 28- Apr. 1  
Thurs. Mar. 31 – Campus closed, Cesar Chavez Day  
Fri. May 13- Warrior Day  
Wed. May 18- Last day of classes  
Final Exams- Fri. May 20, 11:15

**Exams:**

Mon. Feb. 29- **Exam #1 (60 pts)**

Mon. April 11- **Exam #2 (70 pts)**

Friday, May 20 11:15 am - **Final Exam (120 pts)**

**Exams/Quizzes/Reports-**

Lab Reports (weeks 1-4) 20 pts. possible

EXAM 1-Mon. Feb. 29- 60 pts.

Quiz #1- Wednesday, Mar. 9, 10 pts (Neanderthal Man: Chapters 1 → 6)

Quiz #2- Wednesday, Mar. 16, 10 pts (Neanderthal Man: Chapters 7 → 16)

Quiz #3- Wednesday, Mar. 23, 10 pts (Neanderthal Man: Chapters 17 → end)

EXAM 2- Mon. Apr. 11- 70 pts.

Final Annotation reports, Wednesday, May 4, 1 p.m. 35 points

Oral Presentation (Labwork), Wednesday May 18, 15 points

Journal Article Presentation- 40 pts. (Apr. 4, Apr. 6, May 6, May 11, or May 16)

FINAL EXAM- Friday, May 20 11:15- 120 pts.

Assessment	Date	Points	Percent of Final Grade
Lab Report 1-4	varies	20 pts.	5.1%
Exam 1	Feb. 29	60 pts.	15.4%
Quiz #1-3	varies	30 pts.	7.7 %
Exam 2	Apr. 11	70 pts.	17.9%
Annotat. Reports	May 4	35 pts.	9.0%
Oral Presentation- short	May 18	15 pts.	3.8%
PowerPoint Lecture	Varies	40 pts.	10.3
Final Exam	May 20	120 pts.	30.8%
		390 pts.	100%

**Each exam will be a mixture of different types of questions** (such as true/false, multiple choice, problems, short answer, and short essay). The first two exams will be based on lecture material and reading in the text. The six lectures given by groups of students will be included on exams 2 and the final exam. The first two exams are not comprehensive. The final exam is comprehensive and will include questions about genome annotation from those laboratory exercises. A simple calculator may be used during the exams. **No leaving** the classroom during exams. The quizzes on Mar. 9, 16, and 23 will be taken entirely from the book “Neanderthal Man: In Search of Lost Genomes” by Svante Pääbo. This book is available in paperback soon and is found in some libraries now. Read it in its entirety and you will do well on these quizzes.

## **Grading Scale (%)**

(these numbers will not be raised; they could be lowered slightly)

<u>%</u>	<u>Grade</u>	<u>%</u>	<u>Grade</u>
94-100	A	74-76	C
90-93	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-59	F

## **Make-up:**

If you know you can not be in class on the day of an exam, please see me beforehand so we can discuss the situation. I may allow you to take the exam at a later date. If something comes up unexpectedly on the day of an exam, please contact me. If you leave a message, leave a phone number and so we can be in touch. Don't 'let it ride' and plan on discussing it with me later. If I don't hear from you promptly, you get a 0.

## **Other Assessments**

**Lab Reports 1-4-** 5 pts. each. These are submitted via email and are due on the following Wednesday at 11 am. Late reports are penalized 1 pt. per day. Each person submits a report.

**Annotation reports (written [35 pts.] and oral [15 pts].)-** The annotations reports are the final products from your gene annotation projects. The type of reports for each gene in your cosmid is well documented and will be explained as you learn how to annotate genes. Your grade will be determined by the neatness, accuracy, thoroughness, coherency, and timeliness of your reports. Each time a section of your report needs to be rewritten, there is a penalty. Reports can be submitted throughout April. All reports are due at 1 p.m. on May 4. Tardiness on the annotation reports will result in a penalty: 10% if it is one workday late, or 20% for 2-5 workdays late, 30% if 6-10 workdays late. These assignments will not be accepted if overdue by more than 10 workdays. Summarize the most interesting puzzle in your gene annotation in a short PowerPoint presentation on May 18.

## **Student Presentations (40 points) - new this year!**

Groups of 4 students will be assigned a peer-reviewed primary journal article that address concepts and techniques covered in this course. Students need to develop and present the contents of the article in either April or May. These reading assignments are designed to help you understand complex concepts and to make you familiar with research in genetic biotechnology. I strongly suggest that your group meet early to discuss the article. The articles are not long but they are not simple. It will take some rereading of certain sections of the paper and researching terms and techniques that you are not familiar with. Everyone needs to read the whole paper but it could be a useful strategy to assign each figure in the article to a student in your group. They will be expected to explain it to other members of the group and to present it to the class during the PowerPoint presentation. Start your PowerPoint presentation with at least 5 minutes of

background information. Eventually you need to refer to every figure in the article. The hard part will be to pull it all together and summarize the key findings. Do this at the end of your presentation. The whole class is counting on you as the content of the article will be included on the next exam. Two-thirds of your grade will come from your student colleagues. They will complete this form after your presentation:

					Total/Comments
Organization/preparation of the presentation.	Excellent. All four were ready to go and well-rehearsed. (4 pts.)	Good. Most of the group members were professional and knew their material. (3 pts.)	Could be better. The group did not seem particularly organized. (2 pts.)	Everybody needs to be better prepared next time. (1 pt.)	
Context/background information	Previous work in this area well described. (8 pts.)	It was a good attempt but incomplete. (6 pts.)	I needed more info. to appreciate the context. (4 pts.)	There was little context provided. (2 pts.)	
Explanation of key figures	Excellent. I really understand the figures now. (16 pts.)	Good- I understand the figures better than before. (12 pts.)	Inconsistent. Some figures poorly described. (8 pts.)	Needs work here. I was unable to follow. (4 pts.)	
Summary of the work.	Excellent- this group brought it all together thoroughly. (8 pts.)	Good. This was a summary that helped clarify some of the key points. (6 pts.)	OK but a little short and lacking in thoroughness. (4 pts.)	The summary was lacking. I needed a much longer, clearer summary. (2 pts.)	
PowerPoint	Good color, graphics, clear figures. A lot of work went into putting the lecture into PowerPoint. (4 pts.)	Good color, graphics, most of the figures easy to read. A fair amount of work went into this assemble. (3 pts.)	OK but not up to standards for college seniors. Review how to make better PowerPoint presentations. (2 pts.)	Unattractive PowerPoint. Much more work needed in this area. (1 pt.)	
					<b>Final TOTAL =</b>

Your classmates will help in grading your presentation- 2/3 of your class presentation score is determined by your classmates. Those scores are the same for each person on your team. Your instructor will determine the other 1/3 of your score. Individual students may be graded differently.

**Oral presentation-** You should create a PowerPoint lecture to summarize the key findings of your gene annotation. You do not need to explain basic genetic terms that have already been explained in class. Rehearse your PowerPoint presentation. The presentation should be 5-7 minutes in length. **Your score will be deducted if your presentation is too long or too short.** You are not allowed to read anything during your presentation. No reading of notes, and no reading of your PowerPoint slides. Use your PowerPoint slides as a rough outline for you to

follow and then know the material well enough to explain each slide without reading it or using notes. Show important screen captures from the analysis of your cosmid and explain them to the class.

### The labs:

BIOL 4840 provides CSU Stanislaus undergraduates the opportunity to contribute to original research involving a large-scale DNA sequencing projects from Washington University St. Louis Genome Sequencing Center. Students will analyze portions of chromosome 3 of *Drosophila elegans* and compare the data to chromosomes of *D. melanogaster* to determine genome *D. elegans* organization. The lab tools will be various types of DNA sequence analysis software. If you successfully complete the annotation of your *Drosophila* clone, give your instructor reliable contact information. You will be contacted to see if you want to be a co-author when Washington University is ready to publish a paper on the comparative genomics of various species of *Drosophila*.

- During the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> Wednesdays of the semester, the class will work together to explore several DNA analysis software tools. During this time, students will learn how to analyze genomic data. Homework from these labs is due at the start of the next lab.
- At the 5th lab meeting of the semester, each student will be assigned a file of DNA from *Drosophila elegans* (35-50 kb).
- Independent project work will happen in class and outside of class.
- On May 18 **each student will give a ~6 minute PowerPoint presentation, summarizing their Annotation work.**

### Class information:

The website <http://www.csustan.edu/Blackboard/> will have a link for this class. On Blackboard, I will post materials pertaining to this class. The lectures for this class will be presented in PowerPoint. The PowerPoint lectures will also be available on-line at <http://www.csustan.edu/Blackboard/>. Lab handouts are also available on Blackboard.

### Notes:

Each Wednesday you work on a computer. Laptops are provided if needed. All of the DNA tools we will use are web-based. If you want to work on your own laptop you can as long as you can connect to the internet in Naraghi Hall. The first four weeks are structured and will include a lab handout that is due the following week. The first hour (or so) of class will be your instructor introducing some important concepts. Both the lab exercises and demonstration materials will be available electronically on the class Blackboard site.

The lectures will relate to the tools of biotechnology. These tools will be introduced more or less chronologically starting with the usage of restriction enzymes for gene cloning in the 1970s and concluding with next generation sequencing and other tools of the last few years.

### Email

I will use email to send you course announcements. The emails are sent to your csustan email account. Email is the good way for you to communicate with me outside of class time. I check my email many times per day on weekdays and periodically on weekends.

**Student Conduct-** The Wednesday activities will run the full two hours. Attendance is required. Do not enroll in this class if you have conflicts or other commitments on Wednesday afternoons. Be on time for class. During the first minutes of many Wednesday lab period we will discuss the day's activities. Do not leave the classroom in the middle of a lecture. Do not use cell phones, ipods, or other electronic devices during class. Computers are only allowed in class as a tool for note taking or class exercises.

**Cheating/Academic Dishonesty-** Students caught cheating are prosecuted as described in the university catalog. A report is filed with the Dean of Student Affairs. Class homework assignments are not group projects. Copying from someone's paper and presenting it as your own is a form of academic dishonesty. All electronic devices (including phones) & headphones must be kept in purses or backpacks during the exams and quizzes. No exceptions. You can use a real calculator and not the calculator function on a cell phone or PDA.

**Taping Policy-** Audiotaping of classes is permitted only with prior permission of the instructor; videotaping is not permitted under any circumstances. Authorized tapes are for the personal use of the student, and may not be distributed to others without the permission of the instructor.

**Guest Policy-** Guests are generally not permitted in this class. For an exception to this policy you must request prior permission.

**How to do well in this class-**

1. **COME TO CLASS** and ask questions. Take good notes, Review and rewrite your notes.
2. Read the chapters accompanying each lecture. Highlight important sections.
3. Start studying for exams early. Avoid cramming the night before exams.
4. Reread the chapters if necessary
5. Study the new terms- use the internet for extra help (there is unlimited amounts of information related to course topics online)
6. If material is unclear, see me during my office hours
7. Start early and work diligently on your lab projects. Keep good lab notes.
8. Keep an eye on all due dates. Start preparing your final lab report early and carefully proof read. Include a table of contents.
9. Make an interesting PowerPoint presentation. Rehearse it so it can presented smoothly.